We claim:

1. A device for the controlled release of chemical molecules comprising:

a plurality of reservoirs;

a rupturable covering enclosing a first end of each reservoir;

a release formulation positioned in each reservoir and comprising the chemical molecules for release;

an expanding material layer positioned in each reservoir; and

a semi-permeable membrane enclosing a second end of each reservoir distal the release formulation, the semi-permeable membrane being operable to permit selected molecules from outside the reservoir to diffuse to the expanding material layer to cause the expanding material layer to expand and displace the release formulation in an amount effective rupture the rupturable membrane and discharge the release formulation from the reservoir.

2. The device of claim 1, further comprising a reservoir cap which covers semi-permeable membrane and a means for selectively disintegrating the reservoir cap to initiate molecular diffusion of fluid molecules from outside the reservoir and through the semi-permeable membrane.

3. The device of claim 1, further comprising a movable piston in each reservoir between the release formulation and the expanding material, wherein expansion of the expanding material layer drives the piston to displace the release formulation.

4. The device of claim 1, wherein the reservoirs are defined within sidewalls and the expanding material layer is disposed between the sidewalls and the release formulation.

5. The device of claim 1, further comprising a collapsible container which separates the release formulation and the expanding material layer, wherein expansion of the expanding material layer collapses the collapsible container to displace the release formulation.

6. The device of claim 1, wherein the reservoirs are disposed in a substrate.

7. The device of claim 1, wherein each reservoir is disposed in a microtube.

8. The device of claim 1, wherein the release formulation is a drug formulation.

9. The device of claim 1, wherein the rupturable covering comprising a thin metal film.

10. The device of claim 1, wherein the expanding material layer comprises an osmotic agent.

11. A device for the controlled release of fluid drug formulation comprising:

a first reservoir comprising a fluid drug formulation;

a second reservoir comprising an inert fluid;

the first reservoir and the second reservoir each having a discharge outlet controlled by a shared flow switch, the flow switch being configured to discharge either the drug formulation or the inert fluid from the device; and

an osmotic engine for driving the fluid drug formulation from the first reservoir and the inert fluid from the second reservoir.

12. The device of claim 11, wherein the osmotic engine comprises (i) a first piston which drives the fluid drug formulation from the first reservoir and (ii) a second piston which drives the inert fluid from the second reservoir.

13. The device of claim 11, wherein the osmotic engine comprises a body containing an osmotic agent covered by an impermeable shell except for an area comprising a semi-permeable membrane.

14. A device for the controlled release of chemical molecules comprising:

an array of microtubes, each microtube comprising a reservoir defined therein;

a release formulation which comprises the chemical molecules, the release formulation being disposed in each reservoir;

a rupturable covering enclosing a first end of each reservoir; and

a means for rupturing the rupturable covering and positively displacing the release formulation through an opening at the first end, to release the chemical molecules.

15. The device of claim 14, wherein the rupturable covering is provided with one or more defects to facilitate rupture.

16. The device of claim 14, wherein the means comprises a layer of an expanding material, and the release formulation is disposed between the layer of expanding material and the rupturable covering.

17. The device of claim 16, wherein a layer of a barrier material is disposed between the release formulation and the expanding material.

18. The device of claim 14, wherein the expanding material can be activated to expand upon application of heat.

19. The device of claim 18, wherein the means for rupturing comprises a resistive heating element or resistive coating for heating the end of the microtube distal the rupturable covering upon application of an electric current through the resistive heating element or resistive coating.

20. The device of claim 18, wherein the means for rupturing comprises a reactive coating over at least a portion of the end of the microtube distal the rupturable covering.

21. The device of claim 14, wherein at least a portion of the microtube is constructed of a shape memory alloy.

22. The device of claim 14, wherein the release formulation is contained in a rigid substructure within the reservoir.

23. The device of claim 14, wherein the release formulation is a drug formulation.

24. The device of claim 14, wherein the rupturable covering comprises a metal foil.

25. The device of claim 14, wherein the microtubes are connected by and extend from a planar base.

26. The device of claim 14, wherein the microtubes and the planar base are constructed of a biocompatible metal.

27. The device of claim 26, wherein the biocompatible metal is selected from the group consisting of titanium, gold, platinum, Nitinol, and stainless steel.

28. The device of claim 25, wherein the microtubes are fused to the planar base by an electroplating process, an electroless plating process, or by a brazing process.

29. The device of claim 14, wherein the planar base is joined to a metal package, which together enclose control electronics for controlling the means for rupturing.

30. A method for the controlled delivery of chemical molecules, comprising:

placing the device of claim 1 at a site for release of the chemical molecules; and

initiating expansion of the expanding material to rupture the rupturable covering and release the chemical molecules at the site.

31. The method of claim 30, wherein the chemical molecules comprise a drug and the site is in vivo.

32. A method for the controlled delivery of a drug formulation, comprising:

placing the device of claim 11 at a site for release of the drug formulation; and

activating the osmotic engine to drive the fluid drug formulation from the first reservoir.

33. The method of claim 32, further comprising switching the flow switch to stop the flow of fluid drug formulation from the first reservoir and to start the flow of inert fluid from the second reservoir.

34. The method of claim 33, further comprising switching the flow switch again to stop the flow of inert fluid from the second reservoir and restart the flow of fluid drug formulation from the first reservoir.

35. A method for the controlled delivery of chemical molecules, comprising:

placing the device of claim 14 at a site for release of the chemical molecules; and

activating the rupturing means to rupture the rupturable covering and release the chemical molecules at the site.

36. The method of claim 35, wherein the chemical molecules comprise a drug and the site is in vivo.

37. The device of claim 1, wherein the rupturable covering is provided with one or more defects to facilitate rupture.

38. The device of claim 1, wherein the expanding material can be activated to expand upon application of heat.